

Health Effects of Sulfur Dioxide

Grades

5 - 8

Subjects

Science (Biology, Chemistry) and Health

Duration

Day one – 20- 30 minutes

5 – 10 minutes on successive days

Final day – 20 minute wrap up

Materials

- Plant observation sheet
- Sulfur dioxide fact sheet
- Health effects of sulfur dioxide worksheet
- Large clear plastic bag
- Tape
- 2 Green plants in a pot (small)
- Small beaker (50-100 ml)
- Sodium nitrate (2g)
- Sulfuric acid (5%)

Objectives

The students will observe the effects of sulfur dioxide gas on plant life.

The students will be able to understand the potential health effects of sulfur dioxide on humans.

The students will be able to obtain information from a government agency fact sheet.

Instructional Input

Sulfur dioxide has adverse health effects on plants and animals. This demonstration will expose a plant to a high concentration of sulfur dioxide gas in a closed container for a brief period of time. This is known as an acute exposure (an exposure to a chemical over a short period of time, generally less than 2 weeks) as opposed to a chronic exposure (an exposure to a chemical over a long period of time, generally a year or more).

It is important to distinguish between acute and chronic exposures. The two types of exposures generally involve different concentrations of chemical exposure as well as differing health effects.

Since the plant will be acutely exposed to a high concentration of sulfur dioxide gas, the effects on the plant will be rapid and severe. This experiment involves toxic sulfur dioxide gas. Teachers should complete this experiment as a demonstration, rather than allowing the students to perform it. Teachers should use a vent hood or conduct the demonstration outside.

PROCEDURE

1. Allow the students to make observations of the plant before placing it in the bag.
2. Place 2 grams of sodium nitrate in the small beaker.
3. Place the beaker and the potted plant inside the plastic bag.
4. Add 2 ml of 5% sulfuric acid to the small beaker and seal the bag shut with the tape.
5. If sulfur dioxide gas leaks from the bag, you will notice a rotten egg smell. Move the students away from the bag until the reaction is complete.
6. Leave the plant in the closed bag for at least 10 minutes.
7. Cut the bag open and allow the gas to disperse.
8. After the plant has aired out, take it back to the classroom.
9. Be sure to wash your hands.
10. Allow the class to make observations of the plant after it has aired out on their *Plant Observation Sheet*. Have them compare it to their initial observations and make note of any changes. Repeat the observation and recording over the next few days. Use the unexposed plant as a comparison.

Evaluation

Make sure the students note the color, leaves, and overall appearance of the plant compared with the health of the unexposed specimen. What do they think might have happened to the plant if it had been exposed to a smaller dose over a longer period of time? Ask the class if they think sulfur dioxide gas might cause adverse health effects in humans.

Guided Practice

Hand out the *Sulfur Dioxide* fact sheet. Allow students time to read through it on their own, or read through it as a class. Solicit reactions about the potential health effects and sources of sulfur dioxide. Next, hand out the *Health Effects of Sulfur Dioxide Worksheet*.

Correct the *Health Effects of Sulfur Dioxide Worksheet* as a class, or have the students hand them in. Go over the answers in detail, pointing out the location of the answer within the text of the fact sheet.

Extended Practice

If you want to spend more time on this subject, you could prepare and administer a brief quiz, or have the students react to the lesson in their daily journals.

Closure

Sulfur dioxide is a toxic substance. The main sources of sulfur dioxide are related to combustion. How can sulfur dioxide emissions be reduced? What are some alternatives to creating sulfur dioxide?

Plant Observation Sheet

Name _____

Please fill out the table according to your observations. You may wish to make sketches in the boxes or on the back. Keep track of this observation sheet; you will need it over the next few days.

	color	leaves	stem	overall
Before exposure				
After exposure				
One day after exposure				
Two days after exposure				
Three days after exposure				

Health Effects of Sulfur Dioxide

Name _____

Give a physical description of sulfur dioxide.

Sulfur dioxide, when combined with moisture can form _____.

About _____ of all the sulfuric acid in the atmosphere is caused by humans.

List at least 4 sources of sulfur dioxide.

_____	_____
_____	_____

In sentence form and in your own words, describe how people are exposed to sulfur dioxide.

List four health effects caused by a short-term (a few minutes) exposure to sulfur dioxide.

_____	_____
_____	_____

When sulfur dioxide combines with moisture in your lungs, it can form _____.

List four health effects caused by long-term exposure to sulfur dioxide.

_____	_____
_____	_____

List four groups of people who may be more sensitive to sulfur dioxide than others.

_____	_____
_____	_____

Health Effects of Sulfur Dioxide

Name_____KEY_____

Give a physical description of sulfur dioxide.

Sulfur dioxide can be found as a liquid or a gas. It is colorless with a strong odor.

Sulfur dioxide, when combined with moisture can form sulfuric acid.

About one third of all the sulfur compounds in the atmosphere is caused by humans.

List at least 4 sources of sulfur dioxide.

- **Burning fossil fuels**
- **Fertilizer manufacturers**
- **Wood and paper mills**
- **Metal smelters**
- **Refineries**
- **Power plants**

In sentence form and in your own words, describe how people are exposed to sulfur dioxide.

If people breathe air with sulfur dioxide in it, they may be exposed.

List four health effects caused by a short-term (a few minutes) exposure to sulfur dioxide.

- **Difficulty breathing**
- **Irritation of the nose, throat, lungs**
- **Coughing**
- **Shortness of breath**
- **Fluid in lungs**
- **Forms sulfuric acid in lungs**

When sulfur dioxide combines with moisture in your lungs, it can form sulfuric acid.

List four health effects caused by long-term exposure to sulfur dioxide.

- **Temporary loss of smell**
- **Headache**
- **Nausea**
- **Dizziness**
- **Irritation of lungs**
- **Phlegm**
- **Coughing**
- **Shortness of breath**
- **Bronchitis**
- **Reduced fertility**

List four groups of people who may be more sensitive to sulfur dioxide than others.

- **Children**
- **Elderly**
- **People with asthma**
- **People with chronic lung disease**
- **People with cardiovascular diseases**